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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/595,523	04/25/2006	Masahiro Nakayama	039.0071	2166

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EXAMINER	
LEE, JAE	

ART UNIT	PAPER NUMBER
2823	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/595,523	NAKAYAMA ET AL.	
	Examiner	Art Unit	
	Jae Lee	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 April 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 April 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *05/22/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claim 3** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Examiner does not comprehend a wet etching by means of an etchant having no Ga-face and N-face selectivity, having etching ability, and having an oxidation-reduction potential of 1.2 V or more is carried out; whereby contaminant metal produced by the dry etching is removed. What is the meaning of an etchant with no Ga-face and N-face selectivity?

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. **Claims 3 and 5** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagisawa (Pub No. US 2001/0018271 A1, hereinafter Yanagisawa) in view of Mizuniwa '157 as evidenced by Tekeuchi '715.

With regards to **claim 3**, Yanagisawa teaches a method of manufacturing a semiconductor substrate, characterized in that in order to remove a process-transformed layer resulting from polishing, dry etching using a halogen plasma is carried out;

Yanagisawa, however, does not teach a gallium nitride semiconductor substrate utilizing a wet etching technique to remove metal contamination.

In the same field of endeavor, Tekeuchi '715 shows evidence that the semiconductor substrate surface GaN can be utilized for cleaning for the use of fabricating light emitting elements (see col. 1, lines 5-9).

It is obvious to one of ordinary skill in the art at the time the invention was made to select a known material based on its suitability for its intended use. In this case, Gallium nitride can be cleaned for removing metal contamination since Mizuniwa '157 teaches that a broadly defined semiconductor wafer can be cleaned using the cleaning process disclosed (see 325 U.S. at 335, 65 USPQ at 301.).

Mizuniwa '157 also teaches that wet etching must be done in order to reduce the metallic contamination such as iron or copper down to a low enough concentrations which would suppress any influence to property and performance of LSIs (see col. 1, lines 32-36).

Therefore, it would have been obvious to a person having ordinary skill in the art to use wet etching on gallium nitride semiconductor substrates in order to reduce the metal contamination such as iron or copper down to a low enough concentration which would suppress any influence to property and performance of LSIs as taught by Mizuniwa '157.

With regards to **claim 5**, Mizuniwa '157 teaches a method characterized in that a wash for taking off organic matter by means of an organic solvent, and a wash by means of an alkaline solution in order to take off nonmetal contaminants are carried out either before or after the wet etching (see col. 15, lines 51-55, alkyl solution used for

cleaning, non-polar alkyl washes out organic matter, see col. 1, lines 47-51, ammonia is an alkaline solution that washes out esters or alcohol).

2. **Claims 1,2,4, and 6** are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuniwa et al. (USP# 5,814,157, hereinafter Mizuniwa '157) in view of Tekeuchi et al. (USP# 5,919,715, hereinafter Tekeuchi '715).

With regards to **claim 1**, Mizuniwa '157 teaches a semiconductor substrate, characterized in the metal contamination on the substrate surface is 10×10^{11} atoms/cm^2 or less (see col. 1, lines 32-34).

Mizuniwa '157, however, does not teach that the semiconductor substrate is gallium-nitride.

In the same field of endeavor, Tekeuchi '715 shows evidence that the semiconductor substrate surface GaN can be utilized for cleaning for the use of fabricating light emitting elements (see col. 1, lines 5-9).

It is obvious to one of ordinary skill in the art at the time the invention was made to select a known material based on its suitability for its intended use. In this case, Gallium nitride can be cleaned for removing metal contamination since Mizuniwa '157 teaches that a broadly defined semiconductor wafer can be cleaned using the cleaning process disclosed (see 325 U.S. at 335, 65 USPQ at 301.).

With regards to **claim 2**, Mizuniwa '157 teaches a semiconductor substrate, characterized in the metal contamination on the substrate surface is 5×10^{11} atoms/cm^2 or less (see col. 1, lines 32-34).

Mizuniwa '157, however, does not teach that the semiconductor substrate is gallium-nitride.

In the same field of endeavor, Tekeuchi '715 shows evidence that the semiconductor substrate surface GaN can be utilized for cleaning for the use of fabricating light emitting elements (see col. 1, lines 5-9).

It is obvious to one of ordinary skill in the art at the time the invention was made to select a known material based on its suitability for its intended use. In this case, Gallium nitride can be cleaned for removing metal contamination since Mizuniwa '157 teaches that a broadly defined semiconductor wafer can be cleaned using the cleaning process disclosed (see 325 U.S. at 335, 65 USPQ at 301.).

With regards to **claim 4**, Mizuniwa '157 teaches a method of manufacturing a gallium-nitride semiconductor substrate, characterized in that wet etching by means of an etchant that is HCl + 0_3, and that has an oxidation-reduction potential of 1.2V or more is carried out (see col. 10, lines 4-5,15-19,40-42).

Mizuniwa '157, however, does not teach that the semiconductor substrate is gallium-nitride.

In the same field of endeavor, Tekeuchi '715 shows evidence that the semiconductor substrate surface GaN can be utilized for cleaning for the use of fabricating light emitting elements (see col. 1, lines 5-9).

It is obvious to one of ordinary skill in the art at the time the invention was made to select a known material based on its suitability for its intended use. In this case, Gallium nitride can be cleaned for removing metal contamination since Mizuniwa '157 teaches that a broadly defined semiconductor wafer can be cleaned using the cleaning process disclosed (see 325 U.S. at 335, 65 USPQ at 301.).

With regards to **claim 6**, Mizuniwa '157 teaches a method characterized in that a wash for taking off organic matter by means of an organic solvent, and a wash by means of an alkaline solution in order to take off nonmetal contaminants are carried to either before or after the wet etching (see col. 15, lines 51-55, alkyl solution used for cleaning, non-polar alkyl washes out organic matter, see col. 1, lines 47-51, ammonia is an alkaline solution that washes out esters or alcohol).

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

a. Motoki et al. (USP# 6,413,626 B1) - Mirror finish of GaN substrates using dry etching and polishing.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jae Lee whose telephone number is 571-270-1224. The examiner can normally be reached on Monday - Friday, 7:30 a.m. - 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JML

FERNANDO L. TOLEDO
PRIMARY PATENT EXAMINER